

Grade 7 - Solving Two-Step Equations - Lesson

Common Core 7.EE.B.4a · maths-pdf.fr/en/

A two-step equation takes two inverse operations to solve. For $px+q=r$, subtract q from both sides and then divide by p . For $p(x+q)=r$, divide by p and then subtract q . The same steps work with fractions and decimals, and you should check the answer in the original equation.

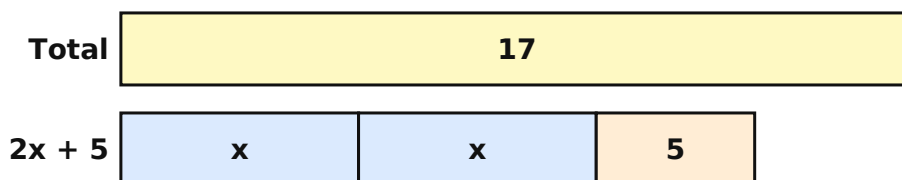
Grade 7 · Common Core State Standards: **7.EE.B.4a**

Key facts

- Two forms: $px+q=r$ and $p(x+q)=r$.
- Undo addition or subtraction first, then multiplication or division.
- Do the same operation to both sides.
- Fractions and decimals follow the same steps as whole numbers.
- Check by substituting the solution into the original equation.

What is a two-step equation?

A **two-step equation** needs two inverse operations to isolate the variable. The two forms in Grade 7 are $px+q=r$ and $p(x+q)=r$, where p , q , and r are rational numbers.

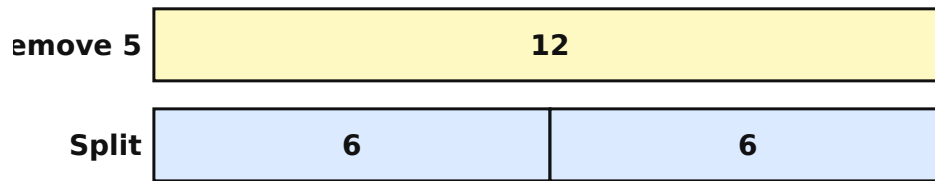


The tape shows $2x + 5 = 17$. Remove the 5, then split the 12 that is left into two equal parts.

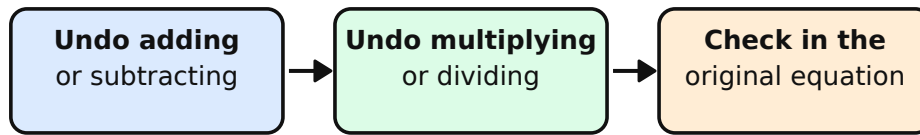
How do you solve $px + q = r$?

1. Undo the addition or subtraction first: subtract q from both sides.
2. Undo the multiplication: divide both sides by p .
3. Check by substituting the answer into the original equation.

Example. $2x+5=17$. Subtract 5: $2x=12$. Divide by 2: $x=6$. Check: $2(6)+5=17$.



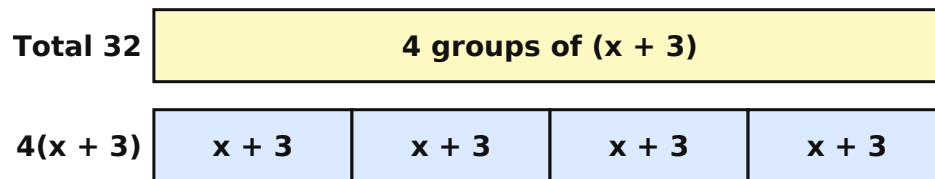
After subtracting 5, the two x bars together are 12, so each x is 6.



Undo operations in the reverse order.

How do you solve $p(x + q) = r$?

You can divide by p first, which undoes the multiplication, and then subtract q . Or you can distribute first and then solve like $px + pq = r$.



Four equal groups of $(x + 3)$ make 32, so each group is 8 and $x = 5$.

$4(x+3)=32$ gives $x+3=8$, so $x=5$.

How is an arithmetic solution different from an algebraic one?

An arithmetic solution works with numbers only: $(17-5) \div 2 = 6$. An algebraic solution writes and solves the equation, which keeps track of every step and works for harder numbers. Both give the same answer, and comparing them shows what each step means.

Equations with rational numbers

The same steps work with fractions and decimals. To solve $\frac{1}{2}x - \frac{3}{4} = \frac{5}{4}$, add $\frac{3}{4}$ to both sides to get $\frac{1}{2}x = 2$, then multiply both sides by 2 to get $x = 4$.

Always write one step per line, do the same thing to both sides, and check your answer in the original equation, not in a rewritten one.

Questions about solving two-step equations

What is the first step in solving $2x + 5 = 17$?

Subtract 5 from both sides to get $2x = 12$. Then divide both sides by 2 to get $x = 6$.

How do you solve $p(x + q) = r$?

Divide both sides by p to get $x + q = r/p$. Then subtract q from both sides. You can also distribute p first.

How do you solve an equation with a fraction coefficient?

Multiply both sides by the reciprocal of the fraction. For $\frac{1}{2}x = 2$, multiply by 2 to get $x = 4$.

How do I check my answer?

Substitute the value into the original equation and simplify. Both sides must be equal.

How is an arithmetic solution related to an algebraic one?

Both use the same operations in the same order. The algebraic solution records each step so it works for any numbers.